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LISTS OF SPECIES

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Checklist of phytobenthos from Boipeba Island, Bahia, Brazil, emphasizing the morphological features of *Nitophyllum punctatum* (Rhodophyta, Ceramiales)

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Abstract: We report here the results of a survey of the phytobenthos of Boipeba Island, Bahia state, Brazil. Samples were collected during three periods (July 2007 and March and December 2012) in the intertidal regions of offshore reefs near the beaches at Ponta dos Castelhanos, Bainema, Moreré, and Tassimirim. A total of 159 taxa were identified: Rhodophyta (83), Chlorophyta (52), Heterokontophyta/Phaeophyceae (21), Cyanobacteria (02), and Magnoliophyta (01). The most representative orders were Ceramiales (Rhodophyta), Bryopsidales (Chlorophyta), and Dictyotales (Heterokontophyta/Phaeophyceae) with 30, 23 and 15 taxa respectively; vouchers were deposited in the herbarium of the Universidade Estadual de Feira de Santana (HUEFS). This work adds 150 new taxa to those already known for Boipeba Island, including *Nitophyllum punctatum* (Stackh. in With.) Grev., whose occurrence is now confirmed for the coast of Bahia. The number of species identified in this study was elevated in comparison with previous phytobenthos studies undertaken on Brazilian islands.

Key words: algae, marine flora, northeastern coast, reef communities

INTRODUCTION

Bahia has the most extensive shoreline (approximately 1,100 km) of any Brazilian state (Bahia 1999), comprising a wide variety of coastal environments and one of the most highly diverse phycological floras in the country (Pereira 2002; Nunes and Guimarães 2008; Bicudo and Menezes 2010).

Although the phycological benthic marine flora of Bahia has been relatively well studied (Nunes 1998; Széchy and Paula 2010; Creed et al. 2010; Moura 2010; Santos and Moura 2011; Alves et al. 2011a, 2011b, 2012a, 2012b, 2012c; Jesus 2012; Almeida et al. 2012; Almeida et al. 2013; Torrano-Silva and Oliveira 2013; Almeida et al. 2014; Moura et al. 2014a), there is still much to be discovered about its coastal ecosystems (especially along the extreme northern and southern beaches) and oceanic islands (such as the Abrolhos Archipelago), as well as the Todos os Santos and Camamu bays and their associated islands (such as Tinharé and Boipeba).

Boipeba Island is part of the Tinharé-Boipeba Environmental Protection Area - APA (created by State Decree n° 1.240, of 05/06/1992) and is located approximately 500 m off the southern coast of Bahia state near Camamu Bay (Rio dos Patos). There are also fringe reefs in the area bordering the islands (that remain submerged during the syzygy low tides), shallow reefs at depths between 5 and 10 m, as well as deep reefs at depths from 10 to 20 m (Kikuchi et al. 2008).

Kikuchi et al. (2008) recorded the presence of nine coral species and one hydrocoral species on the reefs in the Tinharé-Boipeba APA and Camamu during a visual census using AGRRA (Ginsburg et al. 1998) and PETRORISCO (Dutra and Kikuchi 2003) protocols. The endemic species *Mussismilia hispida* Verrill, 1902, *Mussismilia braziliensis* Verrill, 1867, *Mussismilia hartti* Verrill, 1868, *Favia gravida* Verrill, 1868, and *Siderastrea stellata* Verrill, 1868, and the hydrocoral *Millepora alcicornis* L., 1758 are common elements of the reef fauna in the area. According to Kikuchi et al. (2008), the corals on this reef area grow in pools and canals in association with large numbers of organisms that constitute the reef communities, such as fish, crustaceans, mollusks, segmented worms, etc., and large quantities of algae (coralline, filamentous, and fleshy algae). Kikuchi et al.

(2008) pointed out the importance of green algae along the reefs at Tinharé-Boipeba and Camamu, as they cover approximately 80% of the shallow reef areas there.

In spite of the great diversity of phytobenthos at Boipeba Island, there had been no specific studies of its phycological flora. A number of species are known to the island, including *Halymenia duchassaingii* (J.Agardh) Kylin (Nunes 2005), *Rhizoclonium africanum* Kütz., and *Valonia aegagropila* C.Agardh (Alves et al. 2009, 2010), as well as three species of *Cladophora* (*C. corallicola Børgesen*, *C. dalmatica* Kütz. and *C. vagabunda* [L.] C.Hoek) (Alves et al. 2012c), *Hypnea musciformis* (Wulfen in Jacq.) J.V.Lamour. (Jesus 2012), *Parvocaulis pusilus* (M.Howe) S.Berger et al., and *Parvocaulis parvulus* (Solms) S.Berger et al. (Moura et al. 2014a). In terms of cyanobacteria, Caires (2013) reported the presence of *Symploca* cf. *hydnoides* Gomont.

Studies of the structures of phytobenthic communities have been used to evaluate environmental impacts on marine environments. According to Oliveira et al. (1999), the biodiversity of marine organisms is correlated to a certain degree with algal community diversity — and this diversity increases ecosystem stability — as the presence of greater numbers of functionally equivalent species with different levels of tolerance to environmental factors make these systems better able to resist environmental impacts (including alterations caused by anthropogenic activities).

The aim of the present study was to undertake a taxonomic survey of the phytobenthos at Boipeba Island, Bahia state and confirm the occurrence of *Nitophyllum punctatum* (Stackh. in With.) Grev. along the Brazilian coast, based on its morphological and reproductive features.

MATERIALS AND METHODS

The study area includes four beaches: Tassimirim (13°34′ S, 038°55′ W), Moreré (13°35′ S, 038°54′ W), Bainema (13°38′ S, 038°53′ W), and Ponta dos Castelhanos (13°40′ S, 038°54′ W), located on Boipeba Island. Boipeba Island is part of Cairu city, on the southeastern coast of Bahia state, in northeastern Brazil (between the latitudes 13°22′ and 13°51′ S, and longitudes 38°51′ and 39°03′ W; Figure 1).

Sampling was undertaken at random during three different periods (July 2007 and March and December 2012) in the intertidal region of the coastal reefs on the four beaches and in the Bainema mangrove swamp; the specimens were removed with the aid of spatulas and held in labeled plastic bags until processed.

The specimens were fixed and preserved in 4% formaldehyde (using seawater) and subsequently identified with the aid of both a stereomicroscope and a light microscope. The taxonomic arrangement used follows Wynne (2011), with the exception of *Feldmannia mitchelliae* (Harv.) H.S.Kim, which was listed in Wynne (2011) as *Hincksia mitchelliae* (Harv.) P.C.Silva, but was considered a synonym by Kim (2010). The taxon author names follow Brummitt and Powell (1992). The voucher specimens were deposited in the Herbarium of the Universidade Estadual de Feira de Santana (HUEFS), Bahia state, Brazil.

RESULTS AND DISCUSSION

A total of 159 taxa were identified (Table 1). The most representative was the phylum Rhodophyta, with 83 taxa, followed by phylum Chlorophyta (52), Heterokontophyta/Phaeophyceae (21), Cyanobacteria (2), and Magnoliophyta (1).

This high richness of red algae (Rhodophyta) had previously been observed in surveys in tropical and warm-temperate regions by Kain and Norton 1990, Marins et al. 2008, and Torrano-Silva and Oliveira 2013. Among the 21 orders encountered, the most representative were: Ceramiales (Rhodophyta) with seven families and 30 taxa; Bryopsidales (Chlorophyta) with five families and 23 taxa; and Dictyotales (Heterokontophyta/ Phaeophyceae), with one family (Dictyotaceae) being represented by 15 taxa (Figure 2). In addition to the latter family, Rhodomelaceae and Gracilariaceae (Rhodophyta) also demonstrated high floristic richness, with 17 and nine taxa respectively. The most representative genera were: *Caulerpa* J.V.Lamour. (with 11 taxa), *Gracilaria* Grev. (9), *Cladophora* Kütz. (6), *Dictyota* J.V.Lamour. (5), followed by *Amphiroa* J.V.Lamour., *Bostrychia* Mont. and *Hypnea* J.V.Lamour. (with 4 taxa each).

The number of species encountered in the present study was similar to previous surveys undertaken on Brazilian oceanic islands. Collections at Fernando de Noronha Island yielded 172 species (Villaça et al. 2006); Atol das Rocas, 93 species (Oliveira and Ugadim 1974, 1976; Villaça et al. 2010); São Pedro and São Paulo, 39 species (Villaça et al. 2006); Trindade and Martin Vaz, 131 species (Villaça et al. 2006); and the Abrolhos Archipelago, 164 species (Torrano-Silva and Oliveira 2013).

Ceramiales and Bryopsidales were the most representative orders in surveys undertaken by Villaça et al. (2006), Villaça et al. (2010), and Torrano-Silva & Oliveira (2013). High numbers of Chlorophyta were encountered on the islands of Trindade and Martin Vaz, with Bryopsidales being the predominant order (65% of the taxa identified), followed by Ceramiales (Villaça et al. 2006).

Among the beaches surveyed at Boipeba Island, Ponta dos Castelhanos demonstrated the greatest taxonomic richness with 109 taxa, followed by Bainema (91), Tassimirim (84), and Moreré (80) (Table 1).

The order Bryopsidales (with five families) and the

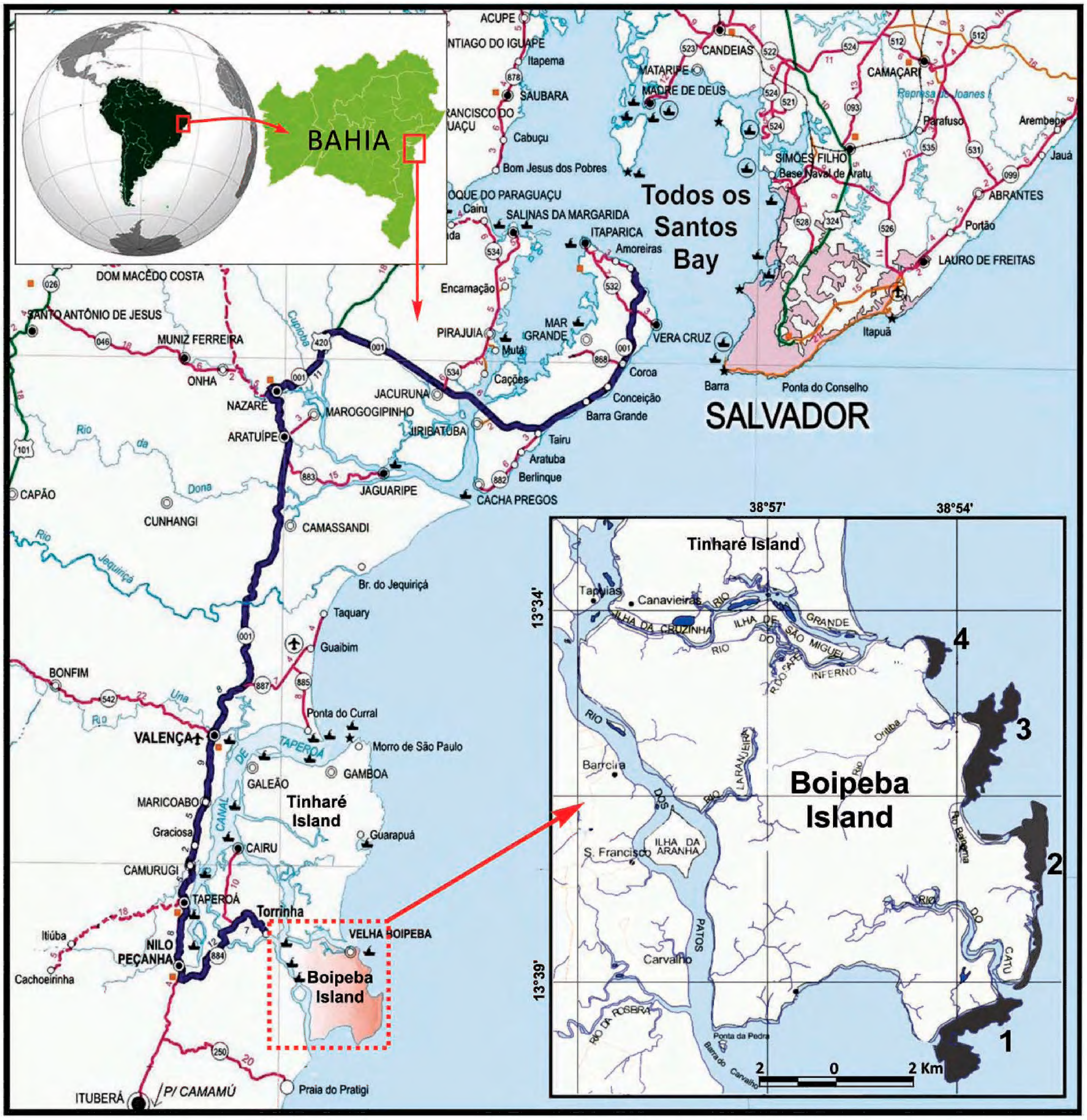

Figure 1. Map of Boipeba Island on the southern coast of Bahia state, Brazil, with highlighting to the beaches studied 1 - Ponta dos Castelhanos, 2 - Bainema, 3 - Moreré, 4 - Tassimirim (adapted from the map of the Tinharé- Boipeba APA and the roadmap of Bahia state).

families Caulerpaceae (eight taxa) and Cladophoraceae (seven taxa) were the richest Chlorophyta taxa at Ponta dos Castelhanos Beach. Among the Heterokontophyta/Phaeophyceae, the family Dictyotaceae (Dictyotales) stood out with 10 taxa. The most expressive order of the Rhodophyta was Ceramiales, with 23 taxa (57% of which belonged to the family Rhodomelaceae).

Bainema Beach demonstrated a flora comparable to that of Ponta dos Castelhanos, although exclusive taxa were collected at the former that had only occasionally been reported for the coast of Bahia, such as *Trichogloea requienii* (Mont.) Kütz., *Parvocaulis myriosporus* (A.B.Joly & Cord.-Mar.) C.W.N.Moura & J.C.De Andrade, and *Parvocaulis parvulus* (Solms) S.Berger et al. The latter species has only recently been cited to the southern Atlantic (Moura et al. 2014a).

Among the drift specimens on Ponta dos Castelhanos Beach, we were able to confirm the presence of *Nitophyllum punctatum* for the coast of Bahia state. Torrano-Silva and Oliveira (2013) had provisionally listed this taxon for the region of the Abrolhos Archipelago (off the coast of southern Bahia), but had not encountered

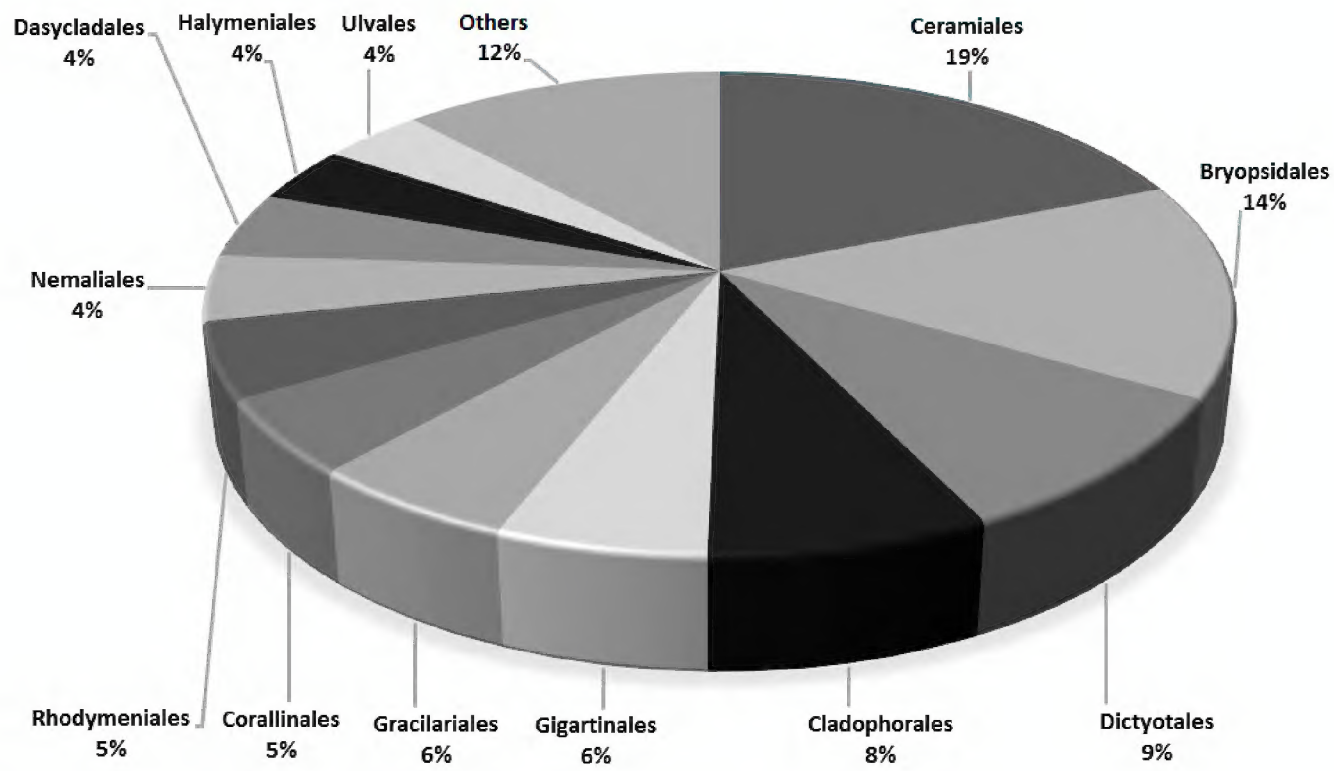

Figure 2. Distributions of the orders of phytobenthos found at Boipeba Island, Bahia state, Brazil.

plants with spermatangial or tetrasporangial sori that could confirm their identification.

The specimens of *N. punctatum* collected at Boipeba Island had thallus blades up to 10 cm tall with delicate appearances, light-red to almost transparent, and composed of repeatedly bifurcating strips that decreased in width toward the terminal portions of the thallus, becoming wedge-shaped; thallus without a central vein, with smooth and undulating edges. Lamina monostromatic, 3–4 cells thick in the basal portion, composed of elongated and polygonal cells, 80–100 µm × 30–50 µm, diminishing in size towards the margins and united by numerous pit-connections; chloroplasts discoid, numerous. Reproductive structures spread along the lamina, except at the base; cystocarps hemispherical, developing on both sides of the lamina, 500–900 µm in diameter, with smooth pericarp and projected ostiole; tetrasporangial sori elliptical to circular, prominent, distributed along the entire thallus on both sides of the lamina, with spherical tetrahedral tetrasporangia 100–160 µm in

Table 1. Phytobenthos from Boipeba Island, Bahia State, Brazil. (A) Ponta dos Castelhanos Beach, (B) Moreré Beach, (C) Bainema Beach, (D) Tassimirim Beach, (1) 2007, (2) 2012, (+) Present and (-) Absent.

		Beach								
		A		B		C		D		
Phylum/Order/Family	**Species**	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**2**	**Number in the Herbarium HUEFS**
Rhodophyta										
Erythropeltidales										
Erythrotrichiaceae	*Erythrotrichia carnea* (Dillwyn) J.Agardh	-	-	-	+	-	+	-	-	187829, 190752
Corallinales										
Corallinaceae										
	Amphiroa anastomosans Weber Bosse	-	+	+	-	+	+	-	+	155482, 155481, 134605, 155479
	Amphiroa fragilissima (L.) J.V.Lamour.	-	+	+	+	-	+	+	+	155489, 155486, 155488, 155484
	Amphiroa rigida J.V.Lamour.	-	+	-	-	-	+	-	-	155477, 154478
	Amphiroa vanbosseae Me. Lemoine	-	+	-	-	-	-	-	-	155483
	Corallina panizzoi Schnetter & U.Richt.	-	+	-	-	-	-	-	-	155495
	Jania adhaerens J.V.Lamour.	+	+	+	-	+	+	-	+	155490, 134610, 134611, 155491
	Jania subulata (J.Ellis & Sol.) Sond.	-	-	-	-	-	+	-	-	155494
	Jania cubensis Mont. ex Kütz.	-	+	-	-	-	-	-	-	155493
Nemaliales										
Liagoraceae	*Liagora ceranoides* J.V.Lamour.	-	-	-	-	-	-	-	+	187810
	Trichogloea requienii (Mont.) Kütz.	-	-	-	-	-	+	-	-	190766
Galaxauraceae	*Dichotomaria marginata* (J.Ellis & Sol.) Lam.	-	+	+	-	+	-	-	-	187808, 130912, 130913
	Dichotomaria obtusata (J.Ellis & Sol.) Lam.	+	-	-	+	-	-	+	+	130911, 187851, 130914
	Galaxaura rugosa (J.Ellis & Sol.) J.V.Lamour.	-	+	+	+	-	+	-	+	187849, 134575, 187848, 187850
	Tricleocarpa cylindrica (J.Ellis & Sol.) Huisman & Borow	-	-	+	-	-	+	+	+	130903, 187836, 130904
	Tricleocarpa fragilis (L.) Huisman & R.A.Towns.	-	-	+	-	+	-	-	-	130906, 130907
Bonnemaisoniales										
Bonnemaisoniaceae	*Asparagopsis taxiformis* (Delile) Trevis.	-	-	+	-	-		+	-	134607, 190771

Continued

Table 1. *Continued.*

Phylum/Order/Family	Species	Beach A 1	A 2	B 1	B 2	C 1	C 2	D 1	D 2	Number in the Herbarium HUEFS
Ceramiales										
Callithamniaceae	*Crouania attenuata* (C.Agardh) J.Agardh	-	+	-	-	-	-	-	-	187797
Ceramiaceae	*Centroceras gasparrinii* (Menegh.) Kütz.	+	-	+	-	-	-	+	-	155497,134576, 134577,
Dasyaceae	*Dasya rigidula* (Kütz.) Ardiss.	+	-	-	-	-	-	-	-	134572
	Heterosiphonia crispella (C.Agardh) M.J.Wynne	-	+	-	-	-	-	-	-	190737
Delesseriaceae	*Caloglossa leprieurii* (Mont.) G.Martens	+	-	-	-	-	-	+	-	187787, 189919
	Nitophyllum punctatum (Stackh. in With.) Grev.	+	-	-	-	-	-	-	-	155514
Rhodomelaceae	*Acanthophora muscoides* (L.) Bory	-	+	-	-	+	+	-	-	190741, 134578
	Acanthophora spicifera (Vahl) Børgesen	+	+	-	+	-	+	-	+	134595, 187796, 187843, 190740
	Bostrychia montagnei Harv.	+	-	-	-	+	+	+	-	189914, 190755, 164817
	Bostrychia moritziana (Sond. *ex* Kütz.) J.Agardh	-	-	-	-	-	+	-	-	187815
	Bostrychia radicans (Mont.) Mont. in Orb.	+	-	-	-	-	+	-	-	189912, 187792
	Bostrychia tenella (J.V.Lamour.) J.Agardh	+	-	-	-	+	+	+	-	189911, 189909, 164816
	Bryocladia cuspidata (J.Agardh) De Toni	-	-	-	-	-	-	+	-	146371
	Bryothamnion seaforthii (Turner) Kütz.	-	+	-	-	-	-	+	-	187789, 147326
	Chondria collinsiana M.Howe	-	+	-	-	-	-	-	-	155509
	Digenea simplex (Wulfen) C.Agardh	-	+	-	+	+	+	-	+	190742, 187834, 147281, 187818
	Herposiphonia tenella (C.Agardh) Ambronn	-	-	-	-	+	-	-	-	155511
	Laurencia sp.	-	-	-	-	+	-	-	-	134604
	Laurencia dendroidea J.Agardh	+	+	+	+	+	+	+	+	187676, 187680, 187681, 187682
	Murrayella periclados (C.Agardh) F.Schmitz	+	-	-	-	-	-	+	-	189910, 164808
	Neosiphonia gorgoniae (Harv.) S.M.Guim. & M.T.Fujii	+	-	-	-	-	-	-	-	134574
	Palisada perforata (Bory) K.W.Nam	-	+	-	+	-	+	-	+	187814, 187811, -187801, 187816
	Vidalia obtusiloba J.V.Lamour.	+	+	-	-	-	-	+	-	134557, 134558
Spyridiaceae	*Spyridia clavata* Kütz.	-	+	-	-	-	-	-	-	190747
	Spyridia filamentosa (Wulfen) Harv. *in* Hook.	-	+	-	-	-	+	-	-	190735, 190739
	Spyridia hypnoides (Bory in Belanger) Papenf.	-	-	-	-	+	-	-	-	136240
Wrangeliaceae	*Griffithsia schousboei* Mont. *in* Webb. var. *schousboei*	-	-	-	-	-	+	-	-	155510
	Griffithsia schousboei var. *anastomosans* E.C.Oliveira	-	+	-	-	-	-	-	-	190769
	Haloplegma duperreyi Mont.	-	-	-	-	+	-	+	-	134573, 134609
	Tiffaniella gorgoniae (Mont.) Doty & Meñez	-	+	-	-	-	+	-	+	133789, 133791, 133794
Gelidiales										
Gelidiaceae	*Gelidium* sp.	-	-	-	-	+	-	-	-	190792
Gelidiellaceae	*Gelidiella acerosa* (Forssk.) Feldmann & Hamel	-	+	-	+	+	+	-	+	187798, 190746, 134603, 187831
Gigartinales										
Cystocloniaceae	*Hypnea cornuta* (Kütz.) J.Agardh	-	-	-	+	-	-	-	-	187845
	Hypnea musciformis (Wulfen *in* Jacq.) J.V.Lamour.	+	+	+	+	-	+	+	+	136246, 136245, 187794, 136241
	Hypnea nigrescens Grev. *ex* J.Agardh	-	-	-	+	-	-	-	-	187844
	Hypnea spinella (C.Agardh) Kütz.	+	+	+	-	-	-	-	-	136242, 136244
Gigartinaceae	*Chondracanthus acicularis* (Roth) Fredericq *in* Hommersand et al.	-	-	-	-	+	-	-	-	190770
Rhizophyllidaceae	*Ochtodes secundiramea* (Mont.) M.Howe	-	+	+	+	+	-	+	+	187795, 134532, 134531, 134530
Solieriaceae	*Agardhiella ramossisima* (Harv.) Kylin	+	+	-	-	-	-	-	-	134556
	Agardhiella subulata (C.Agardh) Kraft & M.J.Wynne	+	-	+	-	-	-	-	-	134554, 134555
	Meristotheca gelidium (J.Agardh) E.J.Faye & Masuda in E.J.Faye et al.	+	-	+	-	+	+	-	-	130910, 130909, 187800
Gracilariales										
Gracilariaceae	*Gracilaria birdiae* Plastino & E.C.Oliveira	-	-	+	-	+	+	+	+	133777, 133776, 133775
	Gracilaria cervicornis (Turner) J.Agardh	+	+	+	+	+	+	+	+	190758, 133780, 133779, 133778
	Gracilaria cuneata Aresch.	+	+	+	-	+	+	-	-	133773, 133774, 133772
	Gracilaria curtissiae J.Agardh	+	+	+	-	-	+	+	+	133768, 133766, 187805, 133767
	Gracilaria domingensis (Kütz.) Sond. *ex* Dickie	+	-	+	-	+	+	+	+	133762, 133759, 133761, 133763
	Gracilaria isabellana Gurgel, Fredericq & J.N.Norris	+	-	+	+	+	+	+	+	133770, 133764, 133771, 133769,
	Gracilaria sp.	+	-	-	-	+	-	+	-	133781, 133783, 133782
	Hydropuntia caudata (J.Agardh) Gurgel & Fredericq	+	+	+	+	+	+	+	+	190744, 187788, 187839, 187840
	Hydropuntia cornea (J.Agardh) M.J.Wynne	+	+	+	+	+	+	+	+	134585, 134586, 134583, 134584
Halymeniales										
Halymeniaceae	*Cryptonemia crenulata* (J.Agardh) J.Agardh	+	-	-	-	-	-	+	+	136238, 136239
	Cryptonemia limensis (Kütz.) J.A.Lewis	-	-	-	-	-	-	+	-	136237

Continued

Table 1. *Continued.*

Phylum/Order/Family	Species	Beach A 1	Beach A 2	Beach B 1	Beach B 2	Beach C 1	Beach C 2	Beach D 1	Beach D 2	Number in the Herbarium HUEFS
	Cryptonemia seminervis (C.Agardh) J.Agardh	-	-	-	+	-	+	+	-	190745, 136236
	Halymenia duchassaingii (J.Agardh) Kylin	-	+	-	-	-	+	-	-	190757, 190753
	Halymenia elongata C.Agardh	-	+	-	-	-	-	-	-	187833
	Halymenia floressi (Clemente) C.Agardh	-	+	-	-	-	-	-	-	187803
Sebdeniales										
Sebdeniaceae	*Sebdenia flabellata* (J.Agardh) P.G.Parkinson	+	-	-	-	-	-	-	-	134580
Peyssonneliales										
Peyssonneliaceae	*Peyssonnelia inamoena* Pilg.	-	-	+	-	-	-	-	-	155496
Rhodymeniales										
Rhodymeniaceae	*Botryocladia occidentalis* (Børgesen) Kylin	+	+	+	+	-	+	+	-	134535, 134537, 187821, 134534
	Botryocladia pyriformis (Børgesen) Kylin	-	-	+	-	-	+	-	-	134536, 187785
Champiaceae	*Champia parvula* (C.Agardh) Harv.	-	+	-	+	-	+	-	+	187819, 190774, 187835, 187804
	Champia feldmanii Díaz-Pif.	+	-	-	+	-	-	-	-	187820, 190775
	Champia vieillardii Kütz.	-	-	-	-	-	-	+	-	136233
Lomentariaceae	*Ceratodictyon planicaule* (W.R.Taylor) M.J.Wynne	-	-	-	-	+	-	-	-	134553
	Ceratodictyon repens (Kütz.) R.E.Norris	-	-	+	-	+	-	-	-	148274, 148275
	Ceratodictyon variabile (Grev. *ex* J.Agardh) R.E.Norris	-	-	-	-	-	-	+	-	134548
Heterokontophyta										
Dictyotales										
Dictyotaceae	*Canistrocarpus cervicornis* (Kütz.) De Paula & De Clerck	+	+	+	+	+	+	+	+	134518, 134515, 134517, 133817
	Canistrocarpus crispatus (J.V.Lamour.) De Paula & De Clerck	-	-	-	+	-	-	-	-	164805
	Dictyopteris delicatula J.V.Lamour.	+	+	+	+	-	+	+	+	133785, 133786, 190754, 133784
	Dictyopteris jamaicensis W.R.Taylor	+	+	-	-	-	-	-	-	133788
	Dictyopteris plagiogramma (Mont.) Vickers	+	-	-	-	-	-	-	-	133787
	Dictyota bartayresiana J.V.Lamour.	-	-	-	-	-	-	-	+	189939
	Dictyota ciliolata Sond. *ex* Kütz.	+	+	+	+	+	+	+	+	134518, 134523, 134525, 134524
	Dictyota crenulata J.Agardh	-	-	+	-	+	+	+	+	134519, 134521, 134520
	Dictyota menstrualis (Hoyt) Schnetter, Hörnig & Weber-Peukert	+	-	-	-	+	-	+	-	134529, 134527, 134526
	Dictyota mertensii (Mart.) Kütz.	+	+	-	+	-	+	+	-	134529, 189928, 134529, 134528
	Lobophora variegata (J.V.Lamour.) Womersley *ex* E.C. Oliveira	+	+	+	+	+	+	+	+	133756, 133757, 133755, 133758
	Padina antillarum (Kütz.) Picc.	-	-	+	-	-	-	+	-	133717, 130916
	Padina boergesenii Allender & Kraft	+	+	+	+	+	-	+	+	108746, 130920, 130917, 130919,
	Padina sanctae-crucis Børgesen	-	-	-	-	-	+	+	-	187922, 130918
	Spatoglossum schroederi (C.Agardh) Kütz.	+	-	+	-	+	+	+	-	134613, 136234, 134612, 134614
Sphacelariales										
Sphacelariaceae	*Sphacelaria rigidula* Kütz.	-	+	-	-	-	-	-	-	155498
Fucales										
Sargassaceae	*Sargassum polyceratium* Mont.	-	-	-	-	+	-	-	-	148293
	Sargassum vulgare C.Agardh	+	-	-	-	-	-	-	-	148292
	Sargassum sp.	-	-	+	-	-	-	+	-	147578, 148278
Ectocarpales										
Acinetosporaceae	*Feldmannia mitchelliae* (Harvey) H.-S.Kim	-	-	-	-	-	-	+		134579
Scytosiphonaceae	*Colpomenia sinuosa* (Roth) Derbès & Solier	+	+	+	+	-	+	+		134568, 134569, 187915, 134570
Chlorophyta										
Ulvales										
Gayraliaceae	*Gayralia brasiliensis* Pellizzari, M.C.Oliveira & N.S. Yokoia	-	-	-	-	-	+	+	-	190767, 134608
Ulvaceae	*Ulva chaetomorphoides* (Børgesen) H.S.Hayden et al.	-	+	-	-	-	-	-	-	190773
	Ulva fasciata Delile	-	-	-	-	-	-	+	-	133754
	Ulva flexuosa Wulfen	+	-	+	-	+	+	+	-	133748, 133747, 133746, 133749
	Ulva flexuosa Wulfen subsp. *paradoxa* (C.Agardh) M.J.Wynne	-	-	-	-	-	+	-	-	187860
	Ulva lactuca L.	+	+	+	+	+	+	+	+	133752, 133753, 133751, 133750
Cladophorales										
Anadyomenaceae	*Anadyomene stellata* (Wulfen *in* Jacq.) C.Agardh	+	+	+	+	+	-	+	-	133815, 133814, 133813, 133812
Cladophoraceae	*Chaetomorpha aerea* (Dillwyn) Kütz.	-	+	-	-	-	-	-	-	155512
	Chaetomorpha antennina (Bory) Kütz.	-	+	-	-	-	-	-	-	187903
	Chaetomorpha brachygona Harv.	+	-	-	+	-	-	-	-	164811, 190785

Continued

Table 1. *Continued.*

Phylum/Order/Family	Species	Beach A 1	A 2	B 1	B 2	C 1	C 2	D 1	D 2	Number in the Herbarium HUEFS
	Cladophora brasiliana G.Martens	-	-	-	+	-	-	-	-	190780
	Cladophora corallicola Børgesen	+	-	-	-	-	-	+	-	136424, 136423
	Cladophora dalmatica Kütz.	+	+	+	+	-	-	-	-	136476, 147505
	Cladophora laetevirens (Dillwyn) Kütz.	+	+	-	-	+	-	-	-	136499, 136498
	Cladophora socialis Kütz.	-	-	-	+	-	-	-	-	190790
	Cladophora vagabunda (L.) C.Hoek	+	-	+	-	+	+	-	-	136551, 136550, 136549
	Rhizoclonium africanum Kütz.	-	-	-	-	-	-	+	-	136299
	Rhizoclonium riparium (Roth) Kütz. *ex* Harv.	+	-	-	-	+	-	-	-	164803, 155500
Siphonocladales										
Boodleaceae	*Cladophoropsis membranacea* (H. Bang *ex* C.Agardh) Børgesen	+	-	-	+	-	-	+	-	136612, 190791, 136613
	Phyllodictyon anastomosans (Harv.) Kraft & M.J.Wynne	-	+	+	-	+	-	+	-	155499, 136327, 136326, 136325
Siphonocladaceae	*Dictyosphaeria versluysii* Weber Bosse	+	+	+	+	+	+	+	+	134588, 136365, 134589, 134591
Valoniaceae	*Valonia aegagropila* C.Agardh	+	+	+	+	+	-	+	-	134606, 134596, 130852, 136638
Bryopsidales										
Bryopsidaceae	*Bryopsis hypnoides* J.V.Lamour.	-	+	-	+	-	-	-	+	187852, 187854, 187855
	Bryopsis pennata J.V.Lamour.	+	-	+	-	+	-	+	+	134546, 134541, 134544, 134542
	Bryopsis plumosa (Huds.) C.Agardh	+	-	+	-	+	-	+	-	134546, 134543, 134544, 134539
Codiaceae	*Codium intertextum* Collins & Herv.	+	-	+	+	+	+	+	-	133793, 133794, 133792, 133795
	Codium isthmocladum Vickers	+	+	+	-	+	+	+	+	133790, 133794, 133791, 133789
	Codium taylorii P.C.Silva	-	-	-	+	-	-	-	-	190788
Caulerpaceae	*Caulerpa cupressoides* (H.West *in* Vahl) C.Agardh	-	-	-	-	-	-	+	-	133718
	Caulerpa cupressoides (H.West *in* Vahl) C.Agardh var. *lycopodium*	+	-	+	-	+	-	+	-	133730, 133723, 133724, 133728
	Caulerpa fastigiata Mont.	-	+	-	-	-	-	+	-	187872, 133731
	Caulerpa kempfii A.B.Joly & S.Pereira	-	+	-	-	-	+	-	-	187875, 187876
	Caulerpa macrophysa Sond. ex Kütz.	-	+	+	-	+	-	+	-	187867, 133732, 133734, 133733
	Caulerpa prolifera (Forssk.) J.V.Lamour.	-	-	-	-	-	-	+	-	133740
	Caulerpa racemosa (Forssk.) J.Agardh	+	-	+	-	+	-	-	-	133720, 133721, 133722
	Caulerpa racemosa (Forssk.) J.Agardh var. *occidentalis* (J.Agardh) Børgesen	+	+	-	+	-	+	+	+	133735, 133736,
	Caulerpa scalpelliformis (R.Br. *ex* Turner) C.Agardh	+	+	+	+	+	+	+	+	133739, 133743 133738, 133737
	Caulerpa sertularioides (S.G.Gmel.) M.Howe	+	+	+	+	+	+	+	+	133742, 133743, 133744, 133741
	Caulerpa verticillata J.Agardh	-	-	+	-	-	-	-	-	190768
Halimedaceae	*Halimeda cuneata* K.Hering	+	+	+	+	+	+	+	-	134564, 134563, 134567, 134565
	Halimeda opuntia (L.) J.V.Lamour.	-	+	+	+	+	+	+	+	187888, 134560, 134559, 134562
Udoteaceae	*Boodleopsis pusilla* (Collins) W.R.Taylor, A.B.Joly & Bernat.	+	-	-	-	-	-	-	-	164814
	Penicillus capitatus Lam.	+	+	+	+	+	+	+	+	134551, 134552, 134547, 134550
	Udotea cyathiformis Decne var. *cyatiformis* f. *sublittoralis* (W.R.Taylor) D.S.Littler & Littler	-	+	-	-	+	-	-	-	187899, 134593
	Udotea flabellum (J.Ellis & Sol.) J.V.Lamour.	+	+	-	-	-	-	+	-	134594, 134592
Dasycladales										
Dasycladaceae	*Neomeris annulata* Dickie	+	+	+	+	+	+	+	+	134599, 134601, 134600, 134602
Polyphysaceae	*Acetabularia calyculus* J.V.Lamour. *in* Quoy & Gaimard	-	+	-	-	-	-	-	-	155504
	Acetabularia crenulata J.V.Lamour.	+	+	-	+	-	-	-	-	134582, 187889
	Acetabularia schenckii K.Möbius	+	+	-	-	-	-	-	-	134581
	Parvocaulis myriosporus (A.B.Joly & Cord.-Mar.) C.W.N.Moura & J.C. De Andrade	-	-	-	-	-	+	-	-	155503
	Parvocaulis parvulus (Solms) S.Berger et al.	-	-	-	-	-	+	-	-	155501
	Parvocaulis pusillus (M.Howe) S.Berger et al.	+	+	-	-	+	-	-	-	130897, 130896
Cyanobacteria										
Nostocales										
Symphyonemataceae	*Bachytrichia quoy* (C.Agardh) Bornetii & Flahaulth	+	-	-	-	-	-	-	-	189944
Oscillatoriales										
Oscillatoriaceae	*Oscillatoria* sp.	-	-	-	-	+	-	-	-	155508
Magnoliophyta										
Alismatales										
Cymodoceaceae	*Halodule wrightii* Asch.	-	-	-	-	+	-	-	-	190772

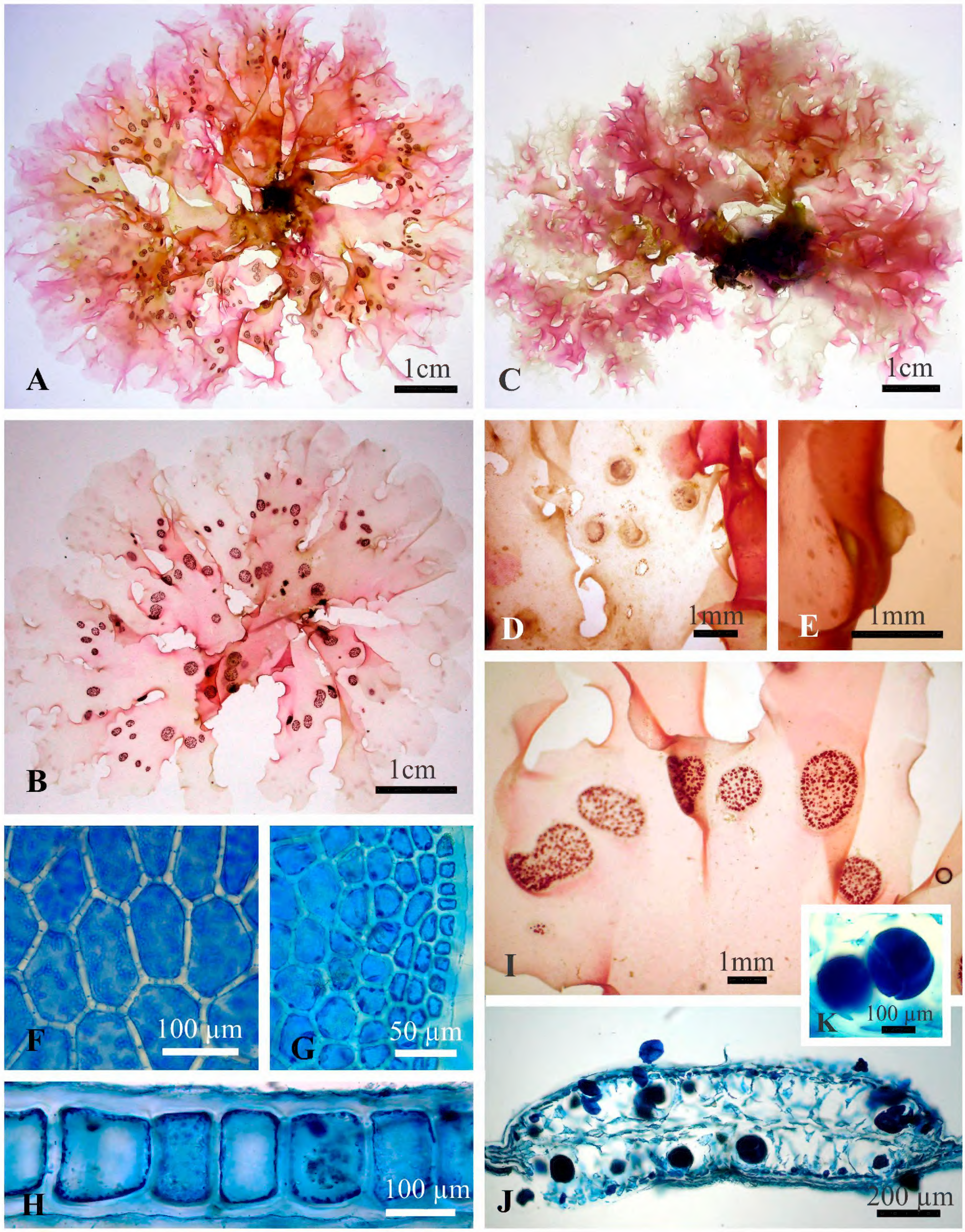

Figure 3. *Nithophyllum pzunctatatum* (Stackh.) Grev. **A**. Tetrasporic plant. **B**. Detail of the sori of the tetrasporangia distributed on the bifurcated lamina; note the undulating margin. **C**. Female plant. **D**. Cystocarps. **E**. Detail of a cystocarp, with ostiole prominent in lateral view. **F**. Surface view of thallus cells with pit-connections. G. Margin of the smooth lamina. **H**. Transversal section of the monostromatic lamina. **I**. Tetrasporangial sorus in surface view. **J**. Transversal section of a tetrasporangial sorus. **K**. Detail of the tetrahedral tetrasporangia.

Table 2. Comparisons of the vegetative and reproductive structures of *Nitophyllum punctatum, N. adhaerens, N. wilksoniae*, and *Haraldiophyllum bonnemaisonii*. ND = no data available

Characteristics	***Nitophyllum punctatum* (Stack. in With.) Grev.**	***Nitophyllum adhaerens* M.J.Wynne**	***Nitophyllum wilksoniae* Collins & Herv.**	***Haraldiophyllum bonnemaisonii* (Kylin) Zinova**
Thalli length	3-50 cm	up to 3-4 cm	up to 10 cm	2-15 cm
Branching	irregular to dichotomous lobed	irregular; deeply lobed	di- to polychotomous	more-or-less regularly dichotomously divided into overlapping lobes
Midrib-like	absent	absent	absent	present; one or more development basally and extending upwards on blade
Blade margins	smooth, slighty undulate	smooth, slighty undulate; presence of peripherical rhizoids uni- or multicelular	small teeth along the margin, undulate	smooth, slighty undulate
Cystocarps (diam.)	(500-) 650-900 µm	650-860 µm	ND	430-600 µm
Ostiole	projecting	projecting	ND	non- projecting
Tetrasporangial sorus distribution	scattered on blade	in terminal lobes	scattered on blade	scattered, over upper two-thirds of blade
Tetrasporangia (diam.)	100-175 µm	38-75 µm	45-60 (-75) µm	50-70 µm
Type locality	Weymouth, Dorset, England	Bocana Reef, Estacion Puerto Morelos, Quintana Roo, Mexico	Bermuda	Orkney Island, Scotland
References	Maggs and Hommersand 1993, This work	Wynne 1997, Surati and Guimães 2007	Dawes and Mathieson 2008, Joly et al. 1965, Littler and Littler 2000	Maggs and Hommersand 1993

diameter (Figure 3). The material examined demonstrated characteristics similar to those described by Maggs and Hommersand (1993) for the British Isles and by Torrano-Silva and Oliveira (2013) for the Abrolhos Archipelago.

Two other species of *Nitophyllum* Grev. have been cited in literature (Moura et al. 2014b) for the Brazilian coast: *N. wilksoniae* Collins & Herv. (reported for the coasts of Bahia, Espírito Santo, and São Paulo) and *N. adhaerens* M.J.Wynne (reported for Espírito Santo, Rio de Janeiro, São Paulo, and Santa Catarina). The characteristics that separate the species are listed in Table 2.

According to Maggs and Hommersand (1993), *N. punctatum* is morphologically similar to *Haraldiophyllum bonnemaisonii* (Kylin) Zinova, although the latter differs by presence of a midrib, and has a smaller cystocarp, without a projected ostiole, and smaller tetrasporangia, approximately 50–70 µm in diameter (Table 2).

The present work added 150 taxa to marine flora the Boipeba Island, including *N. punctatum*, and confirmed its occurrence along the Bahian coast.

This survey of the phytobenthic biodiversity of Boipeba Island was undertaken to increase our knowledge of the insular marine flora and reef communities that compose the rich natural ecosystems along the coast of Bahia state, Brazil.

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